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ABC Analysis & Multi-criteria Decision Making Application:

A PRACTICAL AND EASY APPROACH

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ABC Analysis & Multi-criteria Decision Making Application: A practical and easy approach

This paper is a presentation and a practical application guide on how to use two powerful and essential tools widely used in the area of Purchasing and Supply Chain management, but also to all types of Management positions.

Activity Based Costing Analysis

The Activity Based Costing Analysis (ABC), is a method based on the activities that are used by the organization in order to produce its products and services. ABC is different than the traditional methods that are used in accounting, since it calculates all the fixed and direct incomes as a variable. In simple words, it allocates the various expenses in relation with the volume and the value of the client's order, the required preparation time, etc. The result is the ABC methodology presenting a quantitative to the higher management.

However, The Pareto Principle, named after economist Vilfredo Pareto, originates when he observed that the 80% of Italy's wealth originates mostly from the 20% of the total population. Since then, this hypothesis is widely known at the 80/20 rule. The Pareto analysis is a method, according to which, the data or the activities are classified according to their proportional importance. The Pareto analysis sorts out the data to three different categories: A, B and C.

According to the 80/20 analysis, the following are occurring:

- 20% of total stock reflects to the 80% of the stock value on a yearly basis (A Class)
- 30% of total stock reflects to the 15% of the stock value on a yearly basis (B Class)
- 50% of total stock reflects to the 5% of the stock value on a yearly basis (C Class)

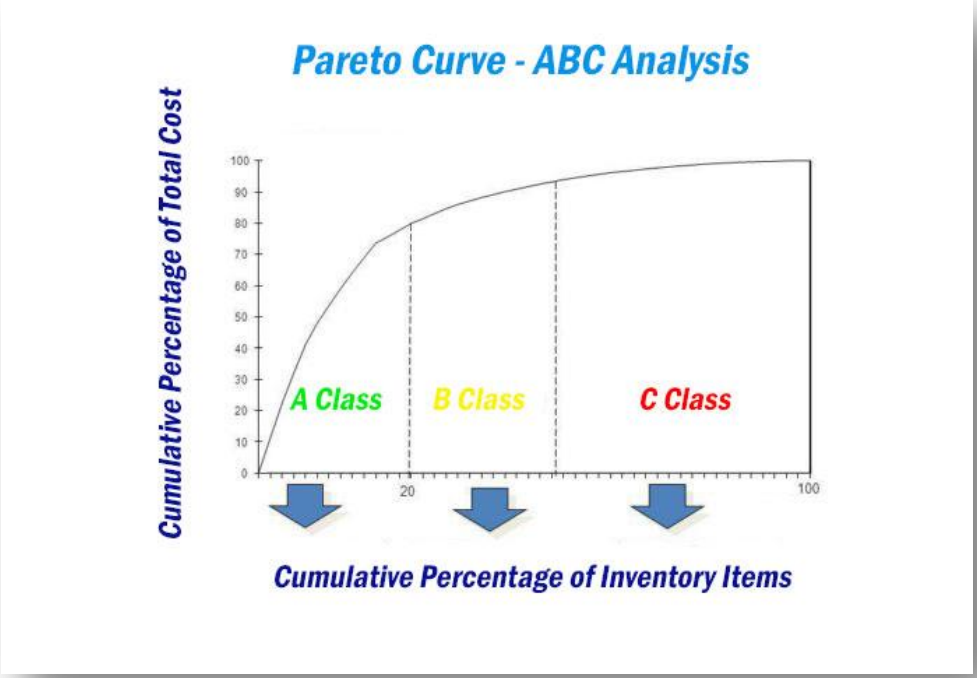
Especially, the category of A Class is considered having a high priority mostly because the codes contained in this category must be properly and frequently checked to ensure that the stock levels are the required ones. The inventory system must be up to date and complex forecast methods must be used as well as to use everything in caution in order to estimate all the parameters correctly.

The codes in the B Class category indicate a medium priority since they could be checked sporadically, ordered in groups instead of independently and be forecasted through simpler methods.

The codes contained in the C Class are of lesser importance in comparison to the previous two types, since they determine cheaper and lower demands of products which could be ordered in large quantities in a massive order (minimization of order frequencies). In addition,

the C Class might also contain products that are extremely expensive with low demand, for which the stock levels can be lowered down to zero (ordering only when demand occurs).

Besides all the above mentioned, the ABC methodology is frequently considered extremely complicated since many people believe that it contains complex and recurrent allocations of costs. In reality, this methodology is based on a few simple principles!



Multi-criteria Decision Making

Multi-criteria Decision Making, is an easy way to calculate the best possible and the least possible option when it comes to making decisions. Those decisions can be related to literally, everything. The Multi-criteria decision making can be applied from simply choosing the best suppliers for your company to deciding the best place for your summer vacation.

In the following paradigm we will create a step by step guide on how to implement the ABC Analysis and later on use it in the Multi-criteria decision making.

Let’s assume the following scenario:

You are the new Head Manager of the Purchasing Department of a mobile phone spare parts' retailer. The company is subcontracting with way too many battery suppliers and you were asked from the CEO to control the situation before it gets out of control. Unfortunately, since you are a new member of this company you are not familiar with the suppliers and all the information you have is listed below:

Supplier	Annual Demand units/year	Unit Cost €/unit	Information
Spare Parts & More	10.000,00	3,80 €	Good prices, average quality, fast shipping, average service
Battery Saver	5.000,00	6,20 €	Expensive products, high quality, express shipping, average service
Low Bat	10.000,00	3,60 €	Good prices, low quality, fast shipping, no service/refunds
Spare Savings	30.000,00	2,20 €	Great prices, excellent customer service, great quality, slow shipping (no rush orders)
Battery Crush	8.000,00	5,00 €	Expensive prices for their quality, average shipping, average service
Power Mode	2.000,00	6,00 €	Expensive products, average quality, express shipping, no service/refunds
Electronica	9.000,00	1,70 €	Cheap products, low quality, slow shipping, no service/refunds
More than Bat	23.000,00	2,00 €	Cheap prices, great quality, excellent service, located near the company

First of all, we apply the Pareto Analysis:

Supplier	Annual Demand units/year	Unit Cost €/unit	Annual Demand		
			€/year	%	% accum
Spare Savings	30.000,00	2,20 €	66.000,00 €	23,21%	23,21%
More than Bat	23.000,00	2,00 €	46.000,00 €	16,18%	39,40%
Battery Crush	8.000,00	5,00 €	40.000,00 €	14,07%	53,46%
Spare Parts & More	10.000,00	3,80 €	38.000,00 €	13,37%	66,83%
Low Bat	10.000,00	3,60 €	36.000,00 €	12,66%	79,49%
Battery Saver	5.000,00	6,20 €	31.000,00 €	10,90%	10,90%
Power Mode	2.000,00	6,00 €	12.000,00 €	4,22%	15,12%
Electronica	9.000,00	1,70 €	15.300,00 €	5,38%	5,38%
Total			284.300,00 €	100,00%	

**Note that the Pareto Analysis is not necessary to proceed to the multi-criteria analysis, but it's presented for educational purposes.*

1. In order to calculate the Annual Demand €/year -> Annual Demand units per year*Unit Cost € per unit.
2. Sum the total cost, it's necessary for the next step
3. Then calculate the percentage by (€ per year/total € per year)*100 (or just select the percentage mode on your excel spreadsheet)
4. Sort the suppliers by €/year (highest to lowest price)
5. Then, in order to find the accumulated percentage, leave the first supplier's percentage and add that to the next supplier. Keep doing this until you reach 80% which according to Pareto is the A Category.
6. The start again and keep going until you reach 15% which according to Pareto is the B Category.
7. Finally, do this one more time, up to 5% in order to estimate the C Category.

Supplier	Annual Demand units/year	Unit Cost €/unit	Annual Demand			Pareto Analysis
			€/year	%	% accum	
Spare Savings	30.000,00	2,20 €	66.000,00 €	23,21%	23,21%	A
More than Bat	23.000,00	2,00 €	46.000,00 €	16,18%	39,40%	
Battery Crush	8.000,00	5,00 €	40.000,00 €	14,07%	53,46%	
Spare Parts & More	10.000,00	3,80 €	38.000,00 €	13,37%	66,83%	
Low Bat	10.000,00	3,60 €	36.000,00 €	12,66%	79,49%	
Battery Saver	5.000,00	6,20 €	31.000,00 €	10,90%	10,90%	B
Power Mode	2.000,00	6,00 €	12.000,00 €	4,22%	15,12%	
Electronica	9.000,00	1,70 €	15.300,00 €	5,38%	5,38%	C
Total			284.300,00 €	100,00%		

Another way is to accumulate from the first to the final supplier and then calculate until the needed percentage.

Supplier	Annual Demand units/year	Unit Cost €/unit	Annual Demand			Pareto Analysis
			€/year	%	% accum	
Spare Savings	30.000,00	2,20 €	66.000,00 €	23,21%	23,21%	A
More than Bat	23.000,00	2,00 €	46.000,00 €	16,18%	39,40%	
Battery Crush	8.000,00	5,00 €	40.000,00 €	14,07%	53,46%	
Spare Parts & More	10.000,00	3,80 €	38.000,00 €	13,37%	66,83%	
Low Bat	10.000,00	3,60 €	36.000,00 €	12,66%	79,49%	
Battery Saver	5.000,00	6,20 €	31.000,00 €	10,90%	90,40%	B
Power Mode	2.000,00	6,00 €	12.000,00 €	4,22%	94,62%	
Electronica	9.000,00	1,70 €	15.300,00 €	5,38%	100,00%	C
Total			284.300,00 €	100,00%		

Either way, it's correct.

In order to proceed with a Multi-criteria Decision Making Analysis, you must create an excel sheet looking like this:

	Attribute 1		Attribute 2		Attribute 3		Attribute 4		Attribute 5		
Weight											
Supplier											**Final Rating**
Spare Savings											
More than Bat											
Battery Crush											
Spare Parts & More											
Low Bat											
Battery Saver											
Power Mode											
Electronica											

At this moment, the **Attributes** we can **Weight** to reach our decision are:

- Pareto Analysis Results
- Price
- Quality
- Logistics
- Service

We need two columns for each **Supplier** for every **Attribute**, one to **Pond (p)** and one for the **Result (r)**.
For this paradigm I will pond from 1 to 3, 1 being the lowest option and 3 being the better option. You can also pond vice versa (3 being the lowest and 1 the better), and the range of numbers can vary regarding to the range of Option (Suppliers for this exercise).

Always **Weight** each **Attribute** according to the significance it contains for the required purpose.

	Pareto Analysis		Price		Quality		Logistics		Service		
Weight	**15**		**25**		**25**		**20**		**15**		
Supplier	**p**	**r**	**p**	**r**	**p**	**r**	**p**	**r**	**p**	**r**	**Final Rating**
Spare Savings	3	45	3	75	3	75	1	20	3	45	260
More than Bat	3	45	3	75	3	75	3	60	3	45	300
Battery Crush	3	45	1	25	2	50	2	40	2	30	190
Spare Parts & More	3	45	2	50	2	50	3	60	2	30	235
Low Bat	3	45	2	50	1	25	3	60	1	15	195
Battery Saver	2	30	1	25	3	75	3	60	2	30	220
Power Mode	2	30	1	25	2	50	3	60	1	15	180
Electronica	1	15	3	75	1	25	1	20	1	15	150

1. After ponding, multiply the **Pond** shell with the **Weight** in the **r** column
2. When everything is calculated, sum the total **r** shells per **Supplier** in the **Final Rating**
3. Then, sort the **Final Rating** from highest to the lowest

Supplier	Final Rating
More than Bat	300
Spare Savings	260
Spare Parts & More	235
Battery Saver	220
Low Bat	195
Battery Crush	190
Power Mode	180
Electronica	150

4. …and observe the final results.

In most times it's suggested to proceed with further research and obtain additional information in order to reach upon a conclusion. Multi-criteria Decision Making is just a great way to assist you, especially when you need to decide among many options.

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